WHAT IS CLAIMED IS:

Sub claim
cont

1. A method for driving a solid image pickup device provided with pixels, each of the pixels comprising an photoelectric conversion part and output

5   means for outputting a signal from the photoelectric conversion part, which method comprises:

dividing photo-electric charges accumulated in the photoelectric conversion part during one unit of accumulation period, and reading out the photo-electric

10   charges via the output means.

2. The method for driving a solid image pickup device according to claim 1, wherein output signals obtained by the division and the readout are

15   individually subjected to noise suppression processing and added to each other.

3. The method for driving a solid image pickup device according to claim 1, wherein the output signals

20   obtained by the division and the readout are individually retained and a horizontal scan is carried out after adding the output signals or while adding the output signals.

25   4. The method for driving a solid image pickup device according to claim 1, wherein signals from the photoelectric conversion part is divided and read out

from a plurality of output means.

5. The method for driving a solid image pickup device according to claim 1, wherein a reset voltage is applied to the a charge-voltage conversion part of the output means to perform a reset operation so that the photoelectric conversion part is not completely depleted by one-time transfer operation.

6. The method for driving a solid image pickup device according to claim 1, wherein a reset voltage is set to a value which lowers a voltage value VFD_{SAT} of the charge-voltage conversion part below the depleting voltage V_{DEP} of the photoelectric conversion part corresponding to a saturated charge quantity Q_{SAT} of the photoelectric conversion part.

7. The method for driving a solid image pickup device according to claim 1, comprising:

a primary readout step of reading out a part of the photo-electric charges accumulated in the photoelectric conversion part to the charge-voltage conversion part of the output means so that the photoelectric conversion part is not completely depleted;

a reset step of resetting the charge-voltage conversion part after the primary readout step; and

a final readout step of reading out residual photo-electric charges accumulated in the photoelectric conversion part to the charge-voltage conversion part so that the photoelectric conversion part is completely depleted after the reset step.

8.   The method for driving a solid image pickup device according to claim 1, comprising:

a first reset step of performing a reset by applying a reset voltage to the charge-voltage conversion part of the output means so that the photoelectric conversion part is not completely depleted by one-time transfer operation;

a primary readout step of reading out a part of the photo-electric charges accumulated in the photoelectric conversion part to the charge-voltage conversion part;

a second reset step of resetting the charge-voltage conversion part after the primary readout step; and

a final readout step of reading out residual photo-electric charges accumulated in the photoelectric conversion part to the charge-voltage conversion part after the second reset step.

9.   The method for driving a solid image pickup device according to claim 1, wherein the output means

comprises:

a semiconductor diffusion region;

a transistor for amplifying voltage signals generated in the semiconductor diffusion region;

5 a transfer gate for transferring a photo-electric charges from the photoelectric conversion part to the semiconductor diffusion region; and

a reset switch for applying a predetermined reset voltage to the semiconductor diffusion region to 10 perform a reset.

10. The method for driving a solid image pickup device according to claim 1, wherein the output means comprises:

15 a charge-voltage conversion part for converting charges from the photoelectric conversion part into voltage signals;

signal amplification means for amplifying the voltage signals generated in the charge-voltage 20 conversion part;

charge transfer means for transferring photo-electric charges from the photoelectric conversion part to the charge-voltage conversion part; and

25 reset means for applying a predetermined reset voltage to the charge-voltage conversion part to perform a reset.

11. A method for driving a solid image pickup device comprising a photoelectric conversion part, a charge-voltage conversion part for converting electric charges from the photoelectric conversion part into

5   voltage signals, signal amplification means for amplifying the voltage signals generated in the charge-voltage conversion part, charge transfer means for transferring photo-electric charges from the photoelectric conversion part to the charge-voltage

10   conversion part, and reset means for applying a predetermined reset voltage to the charge-voltage conversion part to perform a reset; which method comprises:

in a readout period of reading out, from the

15   photoelectric conversion part, photo-electric charges accumulated in the photoelectric conversion part during one unit of accumulation period,

transferring a part of the photo-electric charges from the photoelectric conversion part to the charge-

20   voltage conversion part, and performing a primary readout operation of reading out output signals amplified by the amplification means to a signal output line, and

then resetting the charge-voltage conversion part,

25   transferring the rest of the photo-electric charges from the photoelectric conversion part to the charge-voltage conversion part, and performing a final readout

operation of reading out output signals amplified by the amplification means to the signal output line.

12. The method for driving a solid image pickup device according to claim 11, wherein the output signals divided and read out by the primary reading out operation and the final reading out operation are individually subjected to noise suppression processing and added to each other.

13. A method for driving a solid image pickup device according to claim 11, wherein the output signals divided and read out by the primary reading out operation and the final reading out operation are individually retained and a horizontal scan is performed after adding the output signals or while adding the output signals.

14. The method for driving a solid image pickup device according to claim 11, wherein signals from the photoelectric conversion part are divided and read out from a plurality of output means.

15. The method for driving a solid image pickup device according to claim 11, wherein the reset voltage is set to a value which lowers a voltage value VFD_{SAT} of the charge-voltage conversion part below the depleting

voltage V_{DEP} of the photoelectric conversion part corresponding to a saturated charge quantity Q_{SAT} of the photoelectric conversion part.

5   16. The method for driving a solid image pickup device according to claim 11, wherein after the primary readout operation and before the final readout operation, at least one intermediate readout operation is performed by resetting the charge-voltage conversion

10   part, transferring a part of the photo-electric charges from the photoelectric conversion part to the charge-voltage conversion part, and reading out output signals amplified by the amplification means to the signal output line.

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      17. The solid image pickup device provided with pixels, each of the pixels comprising a photoelectric conversion part and output means for outputting signals from the photoelectric conversion part, wherein a

20   circuit is provided for dividing photo-electric charges accumulated in the photoelectric conversion part during one unit of accumulation period and reading out the photoelectric charges via the output means.

25   18. The solid image pickup device according to claim 17, further comprising a noise suppressing circuit for subjecting the output signals divided and

read out to noise suppression processing, and an addition circuit for adding the output signals subjected to the noise suppression processing.

5   19. The solid image pickup device according to claim 17, further comprising: a retention circuit for individually retaining the output signals divided and read out; and a scanning circuit for performing a scan after adding the output signals retained or while 10   adding the output signals retained.

      20. The solid image pickup device according to claim 17, further comprising a plurality of transfer gates for dividing and reading out the output signals 15   from the photoelectric conversion part.

      21. The solid image pickup device according to claim 17, further comprising a reset switch for applying a reset voltage to the charge-voltage 20   conversion part of the output means so that the photoelectric conversion part is not completely depleted by one-time transfer operation, and performing a reset.

25   22. The solid image pickup device according to claim 17, wherein a reset voltage is set to a value which lowers a voltage value VFD_{SAT} of the charge-

voltage conversion part below the depleting voltage V_{DEP} of the photoelectric conversion part corresponding to a saturated charge quantity Q_{SAT} of the photoelectric conversion part.

23. The solid image pickup device according to claim 17, comprising a control circuit for control so as to perform:

a primary readout step of reading out a part of the photo-electric charges accumulated in the photoelectric conversion part to the charge-voltage conversion part of the output means so that the photoelectric conversion part is not completely depleted;

a reset step of resetting the charge-voltage conversion part after the primary readout step; and

a final readout step of reading out the rest of the photo-electric charges accumulated in the photoelectric conversion part to the charge-voltage conversion part so that the photoelectric conversion part is completely depleted, after the reset step.

24. The solid image pickup device according to claim 17, comprising a control circuit for control so as to perform:

a first reset step of performing a reset by applying a reset voltage to the charge-voltage

conversion part of the output means so that the photoelectric conversion part is not completely depleted by one-time transfer operation;

a primary readout step of reading out a part of

5   the photo-electric charges accumulated in the photoelectric conversion part to the charge-voltage conversion part;

a second reset step of resetting the charge-voltage conversion part after the primary readout step;

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a final readout step of reading out the rest of the photo-electric charges accumulated in the photoelectric conversion part to the charge-voltage conversion part after the second reset step.

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25.   The solid image pickup device according to claim 17, wherein the output means comprises:

a semiconductor diffusion region;

a transistor for amplifying voltage signals

20 generated in the semiconductor diffusion region;

a transfer gate for transferring photo-electric charges from the photoelectric conversion part to the semiconductor diffusion region; and

a reset switch for applying a predetermined reset

25 voltage to the semiconductor diffusion region to perform a reset.

26. The solid image pickup device according to claim 17, wherein the output means comprises:

a charge-voltage conversion part for converting electric charges from the photoelectric conversion part

5 to voltage signals;

signal amplification means for amplifying the voltage signals generated in the charge-voltage conversion part;

charge transfer means for transferring a

10 photo-electric charges from the photoelectric conversion part to the charge-voltage conversion part; and

reset means for applying a predetermined reset voltage to the charge-voltage conversion part to

15 perform a reset.

27. A solid image pickup device, comprising:

a photoelectric conversion part;

a charge-voltage conversion part for converting

20 electric charges from the photoelectric conversion part to voltage signals;

signal amplification means for amplifying the voltage signals generated in the charge-voltage conversion part;

25 charge transfer means for transferring photo-electric charges from the photoelectric conversion part to the charge-voltage conversion part,

and

reset means for applying a predetermined reset voltage to the charge-voltage conversion part to perform a reset,

5   wherein the solid image pickup device further comprises a control circuit for control so as to, in a readout period of reading out from the photoelectric conversion part photo-electric charges accumulated in the photoelectric conversion part during one unit of

10   accumulation period, transfer the photo-electric charges from the photoelectric conversion part to the charge-voltage conversion part, and perform a primary readout operation of reading out output signals amplified by the amplification means to a signal output

15   line, and then to reset the charge-voltage conversion part, transfer the photo-electric charges from the photoelectric conversion part to the charge-voltage conversion part and perform a final readout operation of reading out output signals amplified by the

20   amplification means to the signal output line.

28.   The solid image pickup device according to claim 17 or 27, wherein the photoelectric conversion part is an embedded-type photodiode.

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29.   An image pickup system comprising:
a solid image pickup device according to claim 17

or 27;

an optical system for focusing a ray of light to the solid image pickup device; and

a signal processing circuit for processing output signals from the solid image pickup device.

30. An image pickup system comprising:

a solid image pickup device according to claim 17 or 27;

an optical system for focusing a ray of light to the solid image pickup device;

a mechanical shutter for determining an exposure time of the solid image pickup device; and

a signal processing circuit for processing output signals from the solid image pickup device.